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The Nature Conservancy's Merwin Preserve

Fish and Aquatic Vegetation Monitoring

Annual Report

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Floodplain restoration monitoring of the aquatic vegetation and fish communities of The Nature Conservancy's Merwin Preserve 2013
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Introduction

In 1999, The Nature Conservancy (TNC) initiated restoration at the 2,000 acre Merwin Preserve at Spunky Bottoms, which lies alongside the Illinois River in Brown County, Illinois. Before its disconnection from the river due to levee construction and conversion to farmland in 1921, the Merwin Preserve consisted of two floodplain lakes known as Elbow and Long lakes and were both rich in natural resources characteristic of floodplain lakes of the Illinois River (Blodgett et al. 2007, TNC Personal Communication 2014). During the initial restoration phase, the Merwin Preserve was allowed to naturally fill with water from precipitation and a native plant community was established through natural colonization and establishment processes (Blodgett et al. 2007). Thus, restoration efforts at the Merwin Preserve have been largely occurring without dramatic interventions such as plantings or habitat construction, a process much like old field succession.

On April 25, 2013, the Merwin Preserve levee (99% at 446 ft asl) was overtopped at 447.52 ft asl which matched the historic river stage crest (447.52 ft asl) for the La Grange reach of the Illinois River in 1995. Once overtopped, the Merwin Preserve levee failed and the property filled within hours. The river stage continued to rise and crested at 448.04 ft asl on April 27, 2013, which was 0.52 ft higher than the former 1995 record (Hobson and The Nature Conservancy 2013). The Emiquon Preserve, a larger TNC restored floodplain wetland upstream of the Merwin Preserve, experienced only a brief influx of river water because its levee is much higher (low spot at 451.3 ft asl and majority at 455.0 ft asl) and remained functional when breeched (Blodgett and The Nature Conservancy 2013). The Merwin Preserve, in contrast, underwent a longer and more thorough inundation for 29 days (Hobson and The Nature Conservancy 2013). In addition, the legal requirement to move the water back out of the Merwin Preserve after the river returned to normal stage meant that another breach in the levee closer to the river had to be intentionally created. The levee failure and subsequent planned breeching allowed for the exchange of nutrients and organisms between the river and the Merwin Preserve. Because the goal of the project is "to restore floodplain native plant and animal communities and to reconnect them to the Illinois River to allow movements of aquatic organisms" (Blodgett et al. 2007), it is important to consider how extreme, but infrequent flood events could potentially impact the dynamics of these and other floodplain restoration projects. Thus, the fish and aquatic vegetation monitoring conducted annually at the Emiquon Preserve was extended to the Merwin Preserve in July-October, following the historic spring flood in 2013.

Materials and Methods

Aquatic Vegetation Sampling and Gear Effort

Aquatic vegetation sampling was conducted monthly from July 11-September 10, 2013 at 15 random sites (Table 1). Submersed aquatic vegetation density is estimated by percent coverage on a vegetation rake, while emergent, non-rooted floating-leaved, and rooted floating-leaved aquatic vegetation density is estimated by percent cover observed within a 2 m circle around the boat (Yin et al. 2000).

Fishing Sampling and Gear Effort

Fish sampling was conducted monthly from April 15-October 25, 2013 using a multiple gear approach at both random and fixed sites (Table 1). Fish sampling consisted of 16 electrofishing runs (15 minutes each), 16 fyke net sets (24 hours each), and 16 mini-fyke net sets (24 hours each) at shoreline or pseudo-shoreline (used for shoreline gear) sites. Four tandem fyke net sets (24 hours each) and four tandem mini-fyke net sets (24 hours each) were also deployed at open water (pelagic) sites (Gutreuter et al. 1995).

Table 1. Dates of aquatic vegetation and fish sampling at the Merwin Preserve in 2013.

Month	Aquatic Vegetation Sampling Dates	Fish Sampling Dates
July	7/11/2013	7/18/2013-7/19/2013, 7/31/2013
August	8/13/2013	8/19/2013-8/20/2013, 8/27/2013
September	9/10/2013	9/24/2013, 9/26/2013-9/27/2013
October		10/23/2013-10/24/2013, 10/28/2013

Results

Aquatic Vegetation Collected and Observed Species

No submersed, emergent, or non-rooted floating leaved aquatic plant species were sampled at any of the 45 random sites in 2013. However, rooted floating-leaved species, American lotus *Nelumbo lutea*, were observed in 15 small beds when the Merwin Preserve was holding water in July. Due to a dramatic reduction in water levels when the levee breech was intentionally deepened, we did not observe American lotus during August and September, likely due to resulting drainage of wet habitats (Figure 1).

Figure 1. Map of The Nature Conservancy's Merwin Preserve displaying all locations where American lotus *Nelumbo lutea* was observed in July 2013.

Total Fish Catch

We collected 9,419 fishes representing 37 species and 12 families in 2013. Catches were dominated by native species regardless of gear used. Non-native species including common carp *Cyprinus carpio*, silver carp *Hypopthalmichthys molitrix*, and bighead carp *Hypopthalmichthys nobilis* were collected and removed (Table 2). Numerous unidentified *Ameiurus* species were likely black bullhead *Ameiurus melas* or brown bullhead *Ameiurus nebulosus* ≤100 mm, unidentified *Etheostoma* species was likely a darter species, unidentified *Ictiobus* species were likely bigmouth buffalo *Ictiobus cyprinellus* or smallmouth buffalo *Ictiobus bubalus* ≤100 mm, and unidentified *Lepomis* species were likely bluegill *Lepomis macrochirus* or pumpkinseed *Lepomis gibbosus* ≤40 mm. Total catch of all fish species varied by gear (Table 3, 4, 5, 6, 7).

Table 2. List showing total catch and percent composition for each fish species collected at the Merwin Preserve in 2013; * represents non-native species.

	Common name	Scientific name	Family	No.	%
	unidentified *Ameiurus* spp.	*Ameiurus* spp.	Ictaluridae	2692	28.58
	gizzard shad	*Dorosoma cepedianum*	Clupeidae	2483	26.36
	western mosquitofish	*Gambusia affinis*	Poeciliidae	1095	11.63
	unidentified *Ictiobus* spp.	*Ictiobus* spp.	Catostomidae	755	8.02
*	common carp	*Cyprinus carpio*	Cyprinidae	367	3.90
	yellow bullhead	*Ameirus natalus*	Ictaluridae	319	3.39
	black bullhead	*A. melas*	Ictaluridae	205	2.18
	white bass	*Morone chrysops*	Moronidae	202	2.14
	white crappie	*Pomoxis annularis*	Centrarchidae	171	1.82
*	silver carp	*Hypopthalmichthys molitrix*	Cyprinidae	159	1.69
	unidentified *Lepomis* spp.	*Lepomis* spp.	Centrarchidae	159	1.69
	bluegill	*Lepomis macrochirus*	Centrarchidae	158	1.68
	shortnose gar	*Lepisosteus platostomus*	Lepisostidae	144	1.53
	black crappie	*P. nigromaculatus*	Centrarchidae	134	1.42
	bigmouth buffalo	*Ictiobus cyprinellus*	Catostomidae	83	0.88
	freshwater drum	*Aplodinotus grunniens*	Sciaenidae	65	0.69
	smallmouth buffalo	*I. bubalus*	Catostomidae	56	0.59
	orangespotted sunfish	*L. humilis*	Centrarchidae	28	0.30
	bullhead minnow	*Pimephales vigilax*	Cyprinidae	24	0.25
	green sunfish	*L. cyanellus*	Centrarchidae	22	0.23
	emerald shiner	*Netropis atherinoides*	Cyprinidae	20	0.21
	bowfin	*Amia calva*	Amiidae	10	0.11
	spotted gar	*L. oculatus*	Lepisostidae	7	0.07
	warmouth	*L. gulosus*	Centrarchidae	7	0.07
	slenderhead darter	*Percina phoxocephala*	Percidae	6	0.06
	logperch	*P. caprodes*	Percidae	5	0.05
	largemouth bass	*Micropterus salmoides*	Centrarchidae	5	0.05
	blackspotted topminnow	*Fundulus olivaceus*	Fundulidae	4	0.04
	blackstriped topminnow	*F. notatus*	Fundulidae	4	0.04
	longnose gar	*L. osseus*	Lepisostidae	4	0.04
*	bighead carp	*H. nobilis*	Cyprinidae	3	0.03
	mud darter	*Etheostoma asprigene*	Percidae	3	0.03
	red shiner	*Cyprinella lutrensis*	Cyprinidae	3	0.03
	river carpsucker	*Carpoides carpio*	Catostomidae	3	0.03
	yellow bass	*M. mississippiensis*	Moronidae	3	0.03
	bluegill x warmouth	*L. macrochirus x L. gulosus*	Centrarchidae	2	0.02
	blackside darter	*P. maculata*	Percidae	2	0.02
	golden shiner	*Notemigonus crysoleucas*	Cyprinidae	2	0.02
	pumpkinseed	*L. gibbosus*	Centrarchidae	2	0.02
	channel catfish	*Ictalurus punctatus*	Ictaluridae	1	0.01
	johnny darter	*E. nigrum*	Percidae	1	0.01
	unidentified *Etheostoma* spp.	*Etheostoma* spp.	Percidae	1	0.01

Total Fish	**9419**
Total Species	**37**
Total Families	**12**

Table 3. List showing total catch, percent composition of total catch, and mean catch per unit effort for each fish species collected while electrofishing at the Merwin Preserve in 2013; * represents non-native species.

Common name	Scientific name	Family	No.	%	CPUE
gizzard shad	*Dorosoma cepedianum*	Clupeidae	2301	63.08	575
unidentified *Ictiobus* spp.	*Ictiobus* spp.	Catostomidae	566	15.52	142
western mosquitofish	*Gambusia affinis*	Poeciliidae	181	4.96	45
* common carp	*Cyprinus carpio*	Cyprinidae	151	4.14	38
* silver carp	*Hypopthalmichthys molitrix*	Cyprinidae	86	2.36	22
bigmouth buffalo	*Ictiobus cyprinellus*	Catostomidae	56	1.54	14
unidentified *Ameiurus* spp.	*Ameiurus* spp.	Ictaluridae	54	1.48	14
smallmouth buffalo	*I. bubalus*	Catostomidae	44	1.21	11
black bullhead	*Ameiurus melas*	Ictaluridae	37	1.01	9
yellow bullhead	*A. natalus*	Ictaluridae	33	0.90	8
freshwater drum	*Aplodinotus grunniens*	Sciaenidae	32	0.88	8
bluegill	*Lepomis macrochirus*	Centrarchidae	22	0.60	6
unidentified *Lepomis* spp.	*Lepomis* spp.	Centrarchidae	18	0.49	5
black crappie	*Pomoxis nigromaculatus*	Centrarchidae	11	0.30	3
white crappie	*Pomoxis annularis*	Centrarchidae	11	0.30	3
shortnose gar	*Lepisosteus platostomus*	Lepisostidae	8	0.22	2
white bass	*Morone chrysops*	Moronidae	8	0.22	2
orangespotted sunfish	*L. humilis*	Centrarchidae	7	0.19	2
bowfin	*Amia calva*	Amiidae	6	0.16	2
warmouth	*L. gulosus*	Centrarchidae	5	0.14	1
* bighead carp	*H. nobilis*	Cyprinidae	2	0.05	1
green sunfish	*L. cyanellus*	Centrarchidae	2	0.05	1
bluegill x warmouth	*Lepomis macrochirus x L. gulosus*	Centrarchidae	1	0.03	<1
emerald shiner	*Netropis atherinoides*	Cyprinidae	1	0.03	<1
golden shiner	*Notemigonus crysoleucas*	Cyprinidae	1	0.03	<1
logperch	*P. caprodes*	Percidae	1	0.03	<1
largemouth bass	*Micropterus salmoides*	Centrarchidae	1	0.03	<1
longnose gar	*L. osseus*	Lepisostidae	1	0.03	<1
yellow bass	*M. mississippiensis*	Moronidae	1	0.03	<1

Total Fish	**3648**
Total Species	**25**
Total Families	**11**

Table 4. List showing total catch, percent composition of total catch, and mean catch per unit effort for each fish species collected with fyke nets at the Merwin Preserve in 2013; * represents non-native species.

Common name	Scientific name	Family	No.	%	CPUE
white bass	*Morone chrysops*	Moronidae	150	17.90	9
* common carp	*Cyprinus carpio*	Cyprinidae	135	16.11	8
shortnose gar	*Lepisosteus platostomus*	Lepisostidae	104	12.41	7
white crappie	*Pomoxis annularis*	Centrarchidae	93	11.10	6
bluegill	*Lepomis macrochirus*	Centrarchidae	91	10.86	6
* silver carp	*Hypopthalmichthys molitrix*	Cyprinidae	63	7.52	4
black bullhead	*Ameiurus melas*	Ictaluridae	60	7.16	4
gizzard shad	*Dorosoma cepedianum*	Clupeidae	33	3.94	2
bigmouth buffalo	*Ictiobus cyprinellus*	Catostomidae	18	2.15	1
black crappie	*P. nigromaculatus*	Centrarchidae	14	1.67	1
unidentified *Ameiurus* spp.	*Ameiurus* spp.	Ictaluridae	14	1.67	1
freshwater drum	*Aplodinotus grunniens*	Sciaenidae	11	1.31	1
unidentified *Ictiobus* spp.	Ictiobus spp.	Catostomidae	11	1.31	1
green sunfish	*L. cyanellus*	Centrarchidae	9	1.07	1
orangespotted sunfish	*L. humilus*	Centrarchidae	6	0.72	<1
smallmouth buffalo	*I. bubalus*	Catostomidae	6	0.72	<1
spotted gar	*L. oculatus*	Lepisostidae	6	0.72	<1
yellow bullhead	*A. natalus*	Ictaluridae	6	0.72	<1
river carpsucker	*Carpoides carpio*	Cyprinidae	3	0.36	<1
bowfin	*Amia calva*	Amiidae	2	0.24	<1
longnose gar	*L. osseus*	Lepisostidae	1	0.12	<1
pumpkinseed	*L. gibbosus*	Centrarchidae	1	0.12	<1
yellow bass	*M. mississippiensis*	Moronidae	1	0.12	<1

Total Fish	**838**
Total Species	**21**
Total Families	**9**

Table 5. List showing total catch, percent composition of total catch, and mean catch per unit effort for each fish species collected with mini-fyke nets at the Merwin Preserve in 2013; * represents non-native species.

Common name	Scientific name	Family	No.	%	CPUE
unidentified *Ameiurus* spp.	*Ameiurus* spp.	Ictaluridae	2612	55.53	163
western mosquitofish	*Gambusia affinis*	Poeciliidae	913	19.41	57
yellow bullhead	*Ameiurus natalus*	Ictaluridae	271	5.76	17
unidentified *Ictiobus* spp.	*Ictiobus* spp.	Catostomidae	178	3.78	11
gizzard shad	*Dorosoma cepedianum*	Clupeidae	145	3.08	9
unidentified *Lepomis* spp.	*Lepomis* spp.	Centrarchidae	141	3.00	9
black crappie	*Pomoxis nigromaculatus*	Centrarchidae	102	2.17	6
black bullhead	*A. melas*	Ictaluridae	68	1.45	4
* common carp	*Cyprinus carpio*	Cyprinidae	52	1.11	3
white crappie	*P. annularis*	Centrarchidae	28	0.60	2
shortnose gar	*Lepisosteus platostomus*	Lepisostidae	25	0.53	2
bullhead minnow	*Pimephales vigilax*	Cyprinidae	24	0.51	2
freshwater drum	*Aplodinotus grunniens*	Sciaenidae	20	0.43	1
emerald shiner	*Netropis atherinoides*	Cyprinidae	19	0.40	1
bluegill	*Lepomis machrochirus*	Centrarchidae	17	0.36	1
orangespotted sunfish	*L. humilus*	Centrarchidae	15	0.32	1
green sunfish	*L. cyanellus*	Centrarchidae	11	0.23	1
white bass	*Morone chrysops*	Moronidae	10	0.21	1
bigmouth buffalo	*Ictiobus cyprinellus*	Catostomidae	7	0.15	<1
slenderhead darter	*Percina phoxocephala*	Percidae	6	0.13	<1
blackspotted topminnow	*Fundulus olivaceus*	Fundulidae	4	0.09	<1
blackstriped topminnow	*F. notatus*	Fundulidae	4	0.09	<1
logperch	*P. caprodes*	Percidae	4	0.09	<1
largemouth bass	*Micropterus salmoides*	Centrarchidae	4	0.09	<1
smallmouth buffalo	*I. bubalus*	Catostomidae	4	0.09	<1
mud darter	*Etheostoma asprigene*	Percidae	3	0.06	<1
red shiner	*Cyprinella lutrensis*	Cyprinidae	3	0.06	<1
blackside darter	*P. maculata*	Percidae	2	0.04	<1
bowfin	*Amia calva*	Amiidae	2	0.04	<1
* silver carp	*Hypopthalmichthys molitrix*	Cyprinidae	2	0.04	<1
warmouth	*L. gulosus*	Centrarchidae	2	0.04	<1
bluegill x warmouth	*Lepomis macrochirus x L. gulosus*	Centrarchidae	1	0.02	<1 <1
golden shiner	*Notemigonus crysoleucas*	Cyprinidae	1	0.02	<1
johnny darter	*E. nigrum*	Percidae	1	0.02	<1
longnose gar	*L. osseus*	Lepisostidae	1	0.02	<1
unidentified *Etheostoma* spp.	*Etheostoma* spp.	Percidae	1	0.02	<1
yellow bass	*M. mississippiensis*	Moronidae	1	0.02	<1

Total Fish	**4704**
Total Species	**32**
Total Families	**12**

Table 6. List showing total catch, percent composition of total catch, and mean catch per unit effort for each fish species collected with tandem fyke nets at the Merwin Preserve in 2013; * represents non-native species.

	Common name	Scientific name	Family	No.	%	CPUE
	white crappie	*Pomoxis annularis*	Centrarchidae	39	20.63	10
	white bass	*Morone chrysops*	Moronidae	34	17.99	9
	bluegill	*Lepomis macrochirus*	Centrarchidae	28	14.81	7
	black bullhead	*Ameiurus melas*	Ictaluridae	26	13.76	7
*	common carp	*Cyprinus carpio*	Cyprinidae	25	13.23	6
	yellow bullhead	*A. natalus*	Ictaluridae	9	4.76	2
	black crappie	*P. nigromaculatus*	Centrarchidae	7	3.70	2
	shortnose gar	*Lepisosteus platostomus*	Lepisostidae	6	3.17	2
	gizzard shad	*Dorosoma cepedianum*	Clupeidae	4	2.12	1
*	silver carp	*Hypopthalmichthys molitrix*	Cyprinidae	4	2.12	1
	smallmouth buffalo	*Ictiobus bubalus*	Catostomidae	2	1.06	1
*	bighead carp	*H. nobilis*	Cyprinidae	1	0.53	<1
	channel catfish	*Ictalurus punctatus*	Ictaluridae	1	0.53	<1
	longnose gar	*L. osseus*	Lepisostidae	1	0.53	<1
	pumpkinseed	*L. gibbosus*	Centrarchidae	1	0.53	<1
	spotted gar	*L. oculatus*	Lepisostidae	1	0.53	<1

Total Fish	**189**
Total Species	**16**
Total Families	**7**

Table 7. List showing total catch, percent composition of total catch, and mean catch per unit effort for each fish species collected with tandem mini-fyke nets at the Merwin Preserve in 2013; * represents non-native species.

Common name	Scientific name	Family	No.	%	CPUE
black bullhead	*Ameiurus melas*	Ictaluridae	14	35.00	4
unidentified *Ameiurus* spp.	*Ameiurus* spp.	Ictaluridae	12	30.00	3
* common carp	*Cyprinus carpio*	Cyprinidae	4	10.00	1
* silver carp	*Hypopthalmichthys molitrix*	Cyprinidae	4	10.00	1
bigmouth buffalo	*Ictiobus cyprinellus*	Catostomidae	2	5.00	1
freshwater drum	*Aplodinotus grunniens*	Sciaenidae	2	5.00	1
western mosquitofish	*Gambusia affinis*	Poeciliidae	1	2.50	<1
shortnose gar	*Lepisosteus platostomus*	Lepisostidae	1	2.50	<1

Total Fish	**40**
Total Species	**7**
Total Families	**6**

Discussion

Our preliminary results may reveal short/long term responses between the aquatic vegetation and fish communities at the Merwin Preserve in 2013 due to major flooding impacts. Data analysis will soon allow us to identify what these responses are which will allow us to better understand how a large disconnected floodplain like the Merwin Preserve and Emiquon Preserve will respond when it is connected to the Illinois River. The knowledge gained will be invaluable for future floodplain restoration projects.

Bycatch

Incidental turtle bycatch from the Merwin Preserve consisted of 101 individuals comprising 55 red-ear slider turtles *Trachems scripta* elegans, 43 western painted turtles *Chrysemys picta belli*, 2 common snapping turtles *Chelydra* serpentine, and 1 spiny soft shell turtle *Apalone spinifera*. All turtles were returned to the water after recording carapace length and sex in 2013.

A total of 2 northern water snakes *Nerodia sipedon* were collected in 2013. No mussels were collected in 2013.

Additional Information

We collected >60 small silver carp in the old pumphouse ditches during July-October that will be used for age/growth analysis to learn more about their life history. Only a few carp were collected during regular fish sampling efforts (pulsed-DC electrofishing only). Once we identified that they were present, we collected a majority of the carp during additional fish sampling events, targeting the carp with a pulsed-DC electrofishing boat. Also, we assisted U.S. Fish and Wildlife Service fisheries technicians by helping them collect >20 small silver carp for telemetry research.

Peer-Reviewed Publications

N/A

Proceedings and Popular Publications

1. Michael Lemke, Andrew F. Casper, T.D. VanMiddlesworth, Heath M. Hagy, Jeffery Walk, Douglas Blodgett, and Keenan Dungey. 2014. Ecological Response of Floodplain Restoration to Flooding Disturbance: A Comparison of the Effects of Heavy and Light Flooding. Proceedings of the World Environmental & Water Resources Congress (American Society of Civil Engineers) in Portland Oregon, June 1-5.

Grants Funded

N/A

Data Presentations at Meetings and Abstracts

1. Michael Lemke[1], Andrew F. Casper[2], TD VanMiddlesworth[2], Heath M. Hagy[3], Jeffery Walk[4], Douglas Blodgett[4], and Keenan Dungey[1]. Ecological Response of Floodplain Restoration to Flooding Disturbance: A Comparison of the Effects of Heavy and Light Flooding.
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[2]Illinois River Biological Station, Illinois Natural History Survey, Havana IL; PH (309) 543-6000; emails: afcasper@illinois.edu
[3]Forbes Biological Station, Illinois Natural History Survey, 2003 CR 1770E, P.O. Box 590, Havana, IL; PH (309) 543-3950; FAX (309) 543-4999; email: hhagy@illinois.edu
[4]Illinois Chapter of The Nature Conservancy, Illinois River Project Office at Emiquon, 11304 North Prairie Road, Lewistown, IL 61542; PH (309) 547-2731; email: jwalk@tnc.org

Major floods elicit calls for more comprehensive and multi-faceted approaches to flood management. In the future, adding floodways and flood storage areas to traditional structural strategies (e.g. dams and levees) may be a viable strategy. Beyond reducing flood damages, there is growing societal interest in floodplain services, including nutrient processing and supporting fisheries and wildlife habitat. In April 2013, a record flood on the Illinois River created a natural floodplain management experiment within two restored, but disconnected floodplains. With the benefit of extensive pre-flood data at both sites, we evaluated the biological response

to a minor (levee overtopping) and a major (levee failure) flooding event. Our intent was to test the ecological resilience of restored floodplains to these two alternative management scenarios. We hypothesized that a minor flood event would have little effect on ecosystem structure, whereas the major flood event would result in lower production and diversity of zooplankton; increase invasive vegetation and decrease desirable submerged and emergent aquatic vegetation; and decrease overall waterbird use. Case studies such as this are critically needed to inform policy-makers and managers of the trade-offs between alternative floodplain connectivity regimes on ecological services.

Outreach, Inter- and Intra-agency Collaboration

1. Assisted U.S. Fish and Wildlife Service fisheries technicians with silver carp telemetry research. 17 September 2013.

Technical Reports

N/A

Literature Cited

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Gutreuter, S., R. Burkhardt, and K. Lubinski. 1995. Long Term Resoruce Monitoring Program Procedures: Fish Monitoring. National Biological Service, Environmental Management Technical Center, Onalaska, WI.

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Yin, Y., J.S. Winkelman, and H.A. Langrehr. 2000. Long Term Resource Monitoring Program Procedures: Aquatic Vegetation Monitoring. U.S. Geological Survey, Upper Midwest Environmental Sciences Center, La Crosse, WI.